FIG 1A (Encoder)

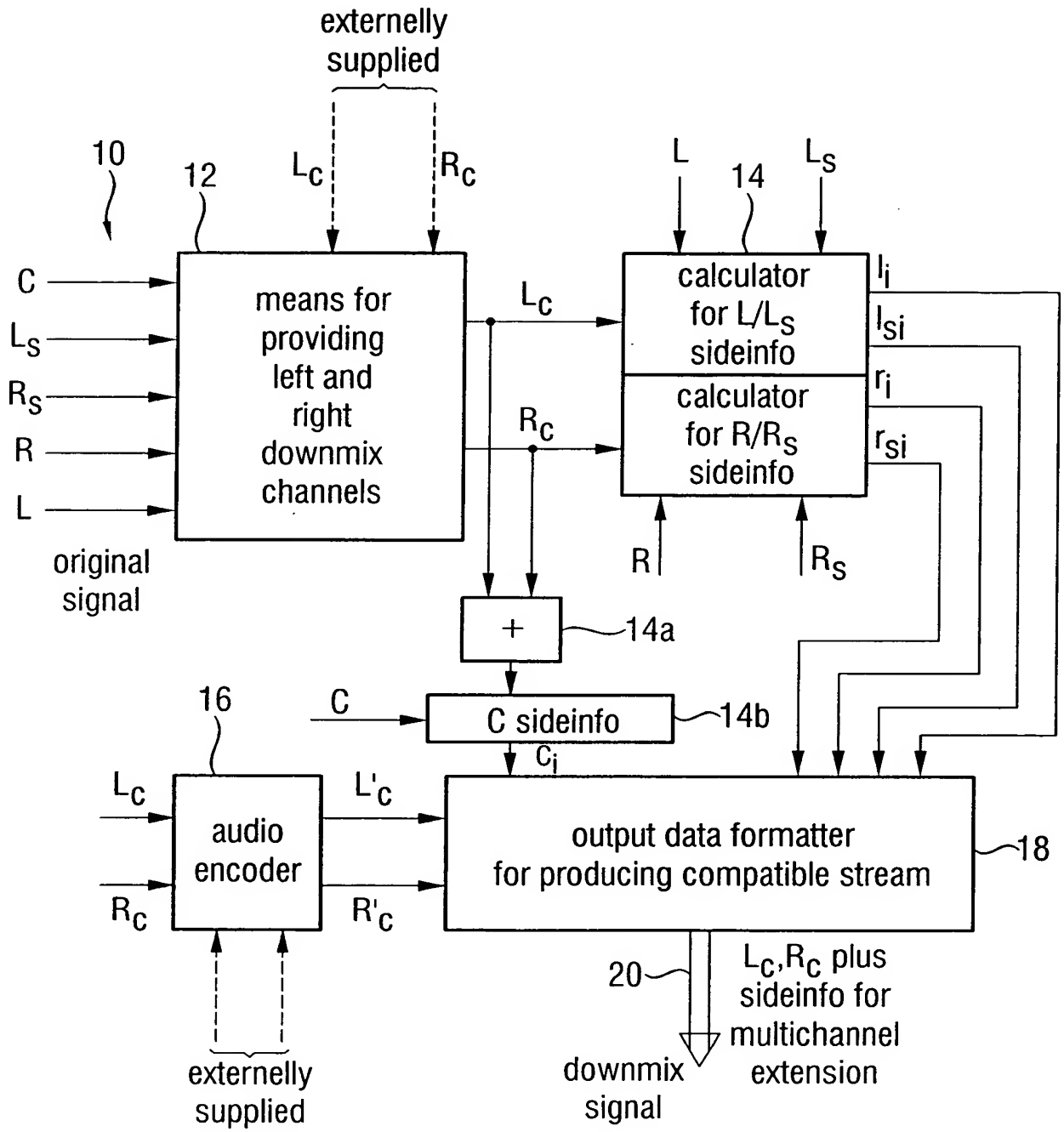


FIG 1B

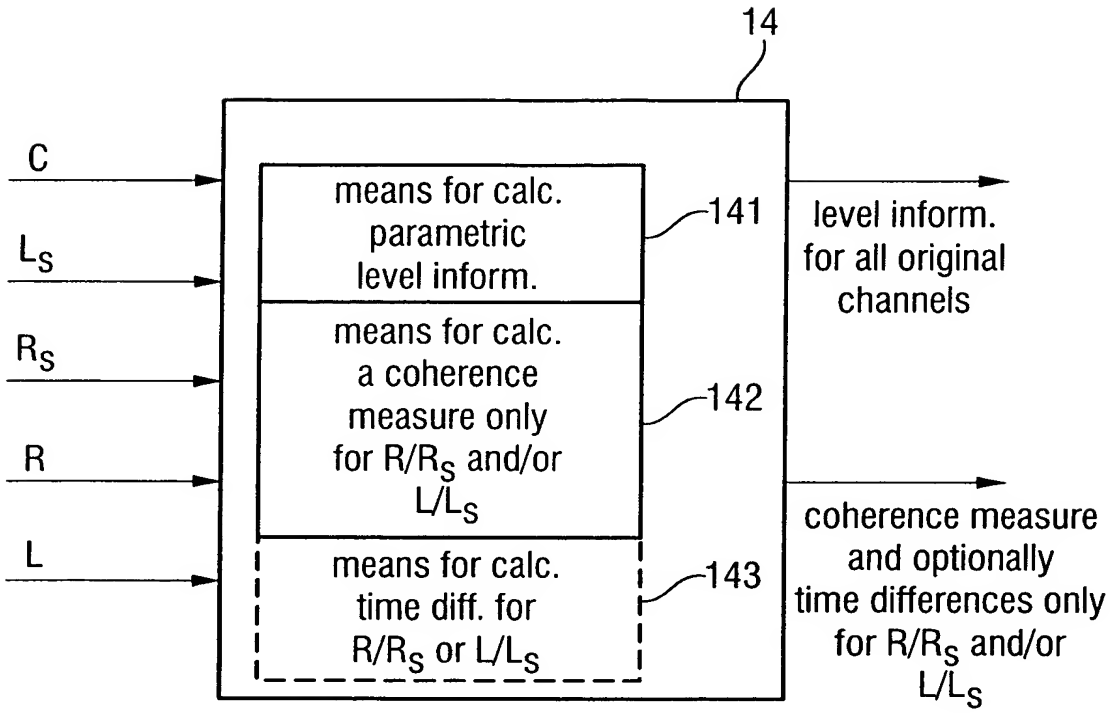

14
C
L_S
R_S
R
L
means for calc. parametric level inform.
141
means for calc. a coherence measure only for R/R_S and/or L/L_S
142
means for calc. time diff. for R/R_S or L/L_S
143
level inform. for all original channels
coherence measure and optionally time differences only for R/R_S and/or L/L_S

FIG 2A (Decoder)

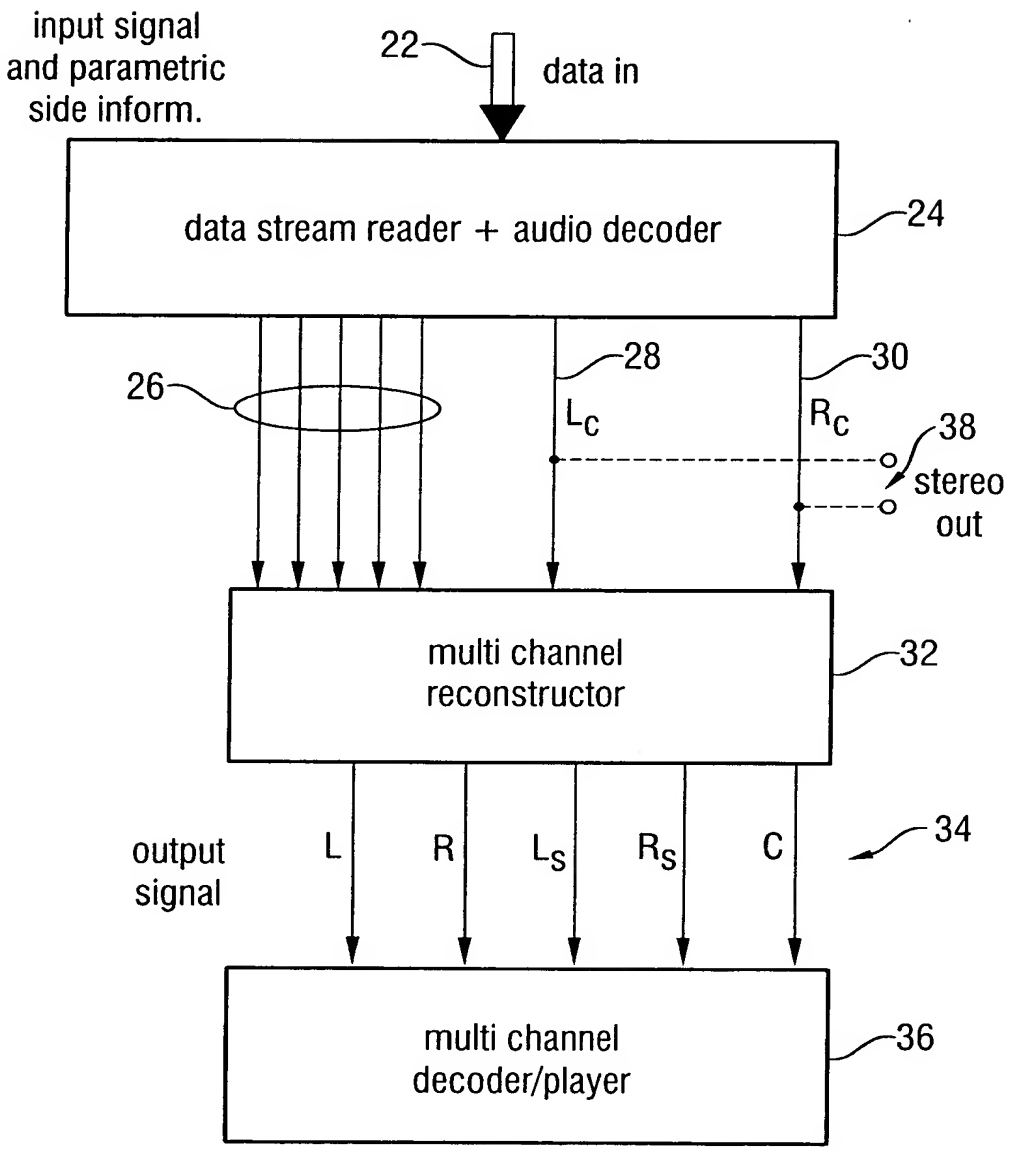


FIG 2B

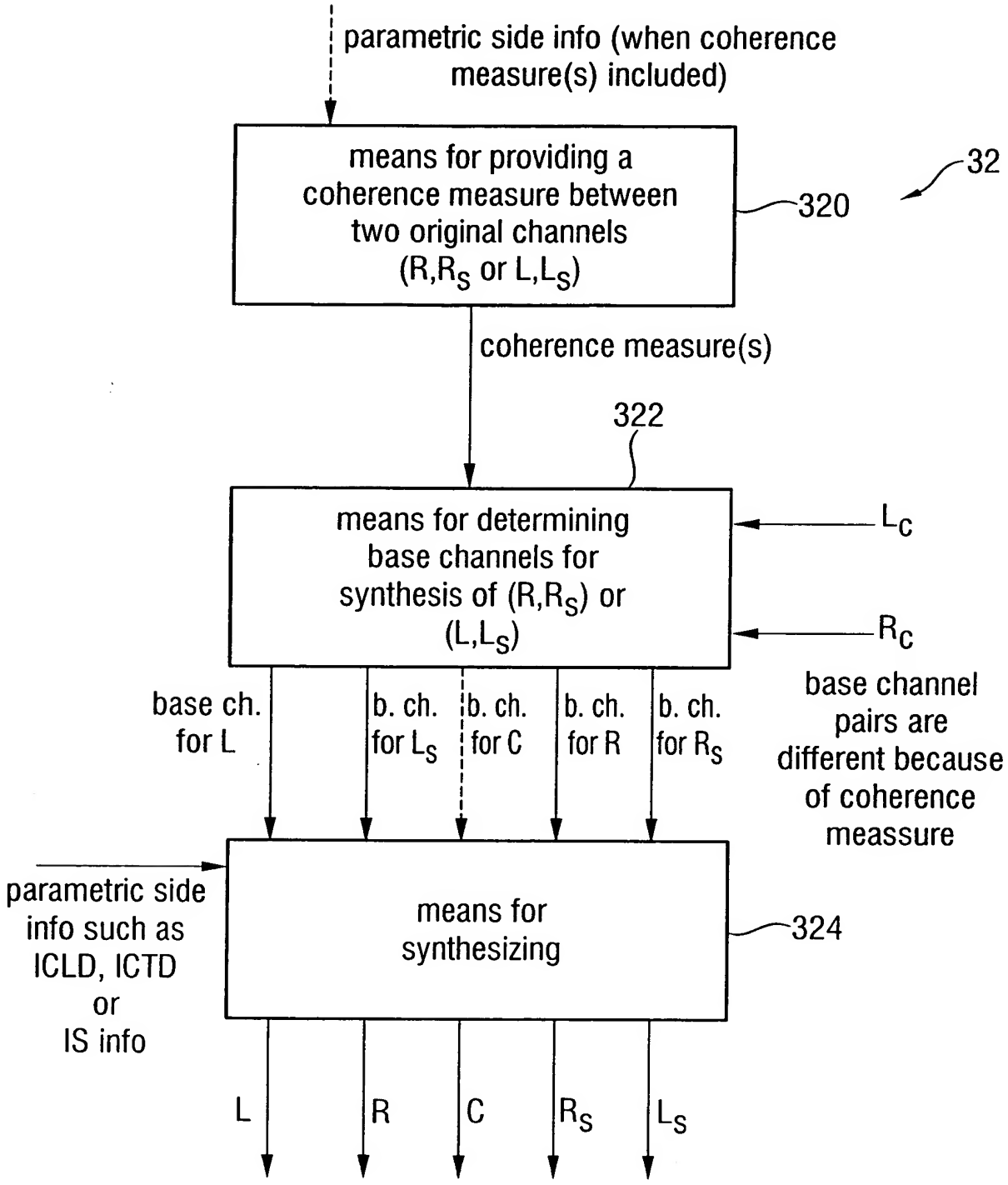

parametric side info (when coherence measure(s) included)
means for providing a coherence measure between two original channels (R,R_S or L,L_S)
320
32
coherence measure(s)
322
means for determining base channels for synthesis of (R,R_S) or (L,L_S)
L_C
R_C
base channel pairs are different because of coherence meassure
base ch. for L
b. ch. for L_S
b. ch. for C
b. ch. for R
b. ch. for R_S
parametric side info such as ICLD, ICTD or IS info
means for synthesizing
324
L
R
C
R_S
L_S

FIG 2C

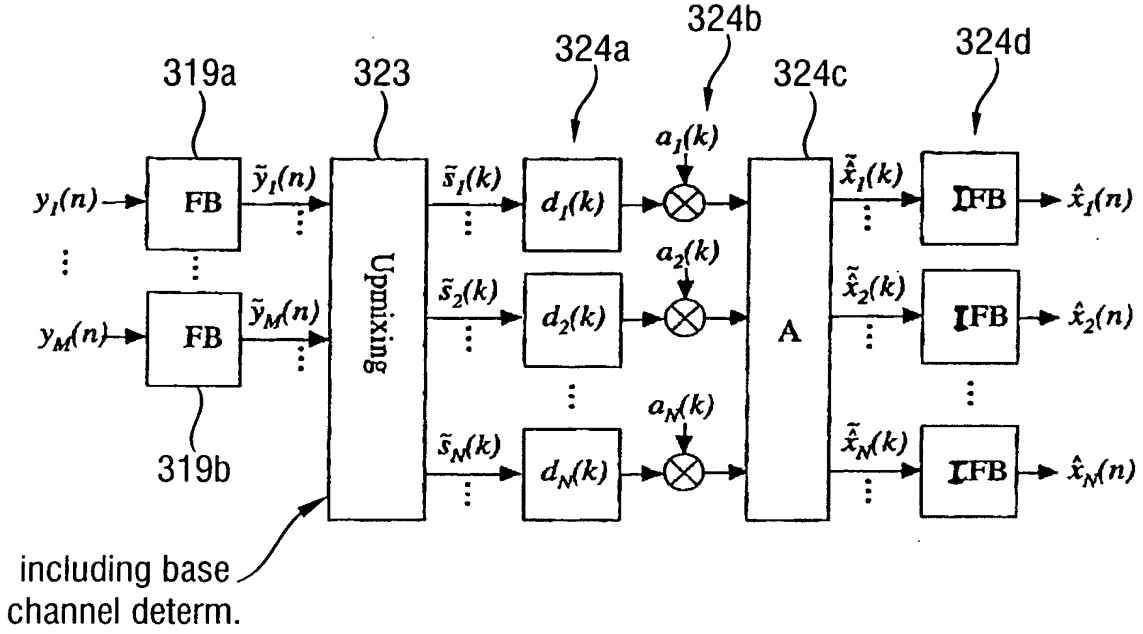

319a
323
324a
324b
324c
324d
FB
FB
Upmixing
A
IFB
IFB
IFB
319b
including base channel determ.

FIG 2D

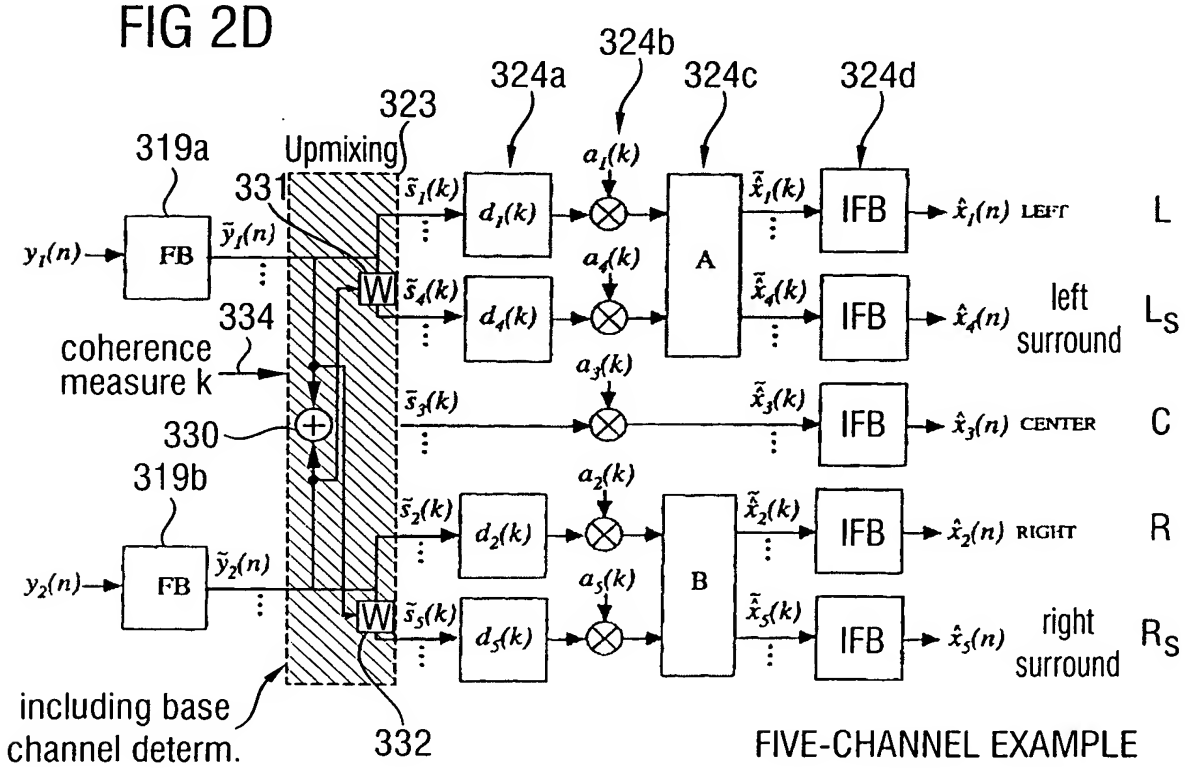

323
324a
324b
324c
324d
319a
Upmixing
331
FB
334
coherence measure k
330
319b
FB
A
B
IFB
IFB
IFB
IFB
IFB
LEFT
left surround
CENTER
RIGHT
right surround
L
L_S
C
R
R_S
including base channel determ.
332
FIVE-CHANNEL EXAMPLE

FIG 2E (encoder side)

means for determining coherence measure

$$cc(x,y)=\frac{\Sigma x_i \cdot y_i}{\sqrt{\Sigma_i x_i^2} \cdot \sqrt{\Sigma_i y_i^2}}$$

cc: coherence measure (cross correlation)

x_i: sample at time instance i of first original channel

y_i: sample at time instance i of 2nd original channel

FIG 2F (decoder side)

base channel for left (L) output channel: $l \triangleq L_c$

base channel for rear left (Ls) output ch.: $l+\alpha \cdot r \triangleq L_c+\alpha \cdot R_c$

$k=cc(l,l+\alpha \cdot r)$

$$\frac{\Sigma l \cdot [l+\alpha \cdot r]}{\sqrt{\Sigma l^2} \cdot \sqrt{\Sigma [l+\alpha \cdot r]^2}}=k$$

$-1 \leq k \leq 1$

α: weighting factor (to be determined)

l: left input channel

r: right input channel

k: coherence measure (time-varyring, transmitted as side information)

$$\alpha_{1;2}=\frac{-B \pm \sqrt{B^2-4AC}}{2A}$$

wherein: $L=\Sigma l^2$ $R=\Sigma r^2$ $C=\Sigma l \cdot r$; and

$A=C^2-k^2LR$ $B=2LC(1-k^2)$ $C=L^2(1-k^2)$.

FIG 2G

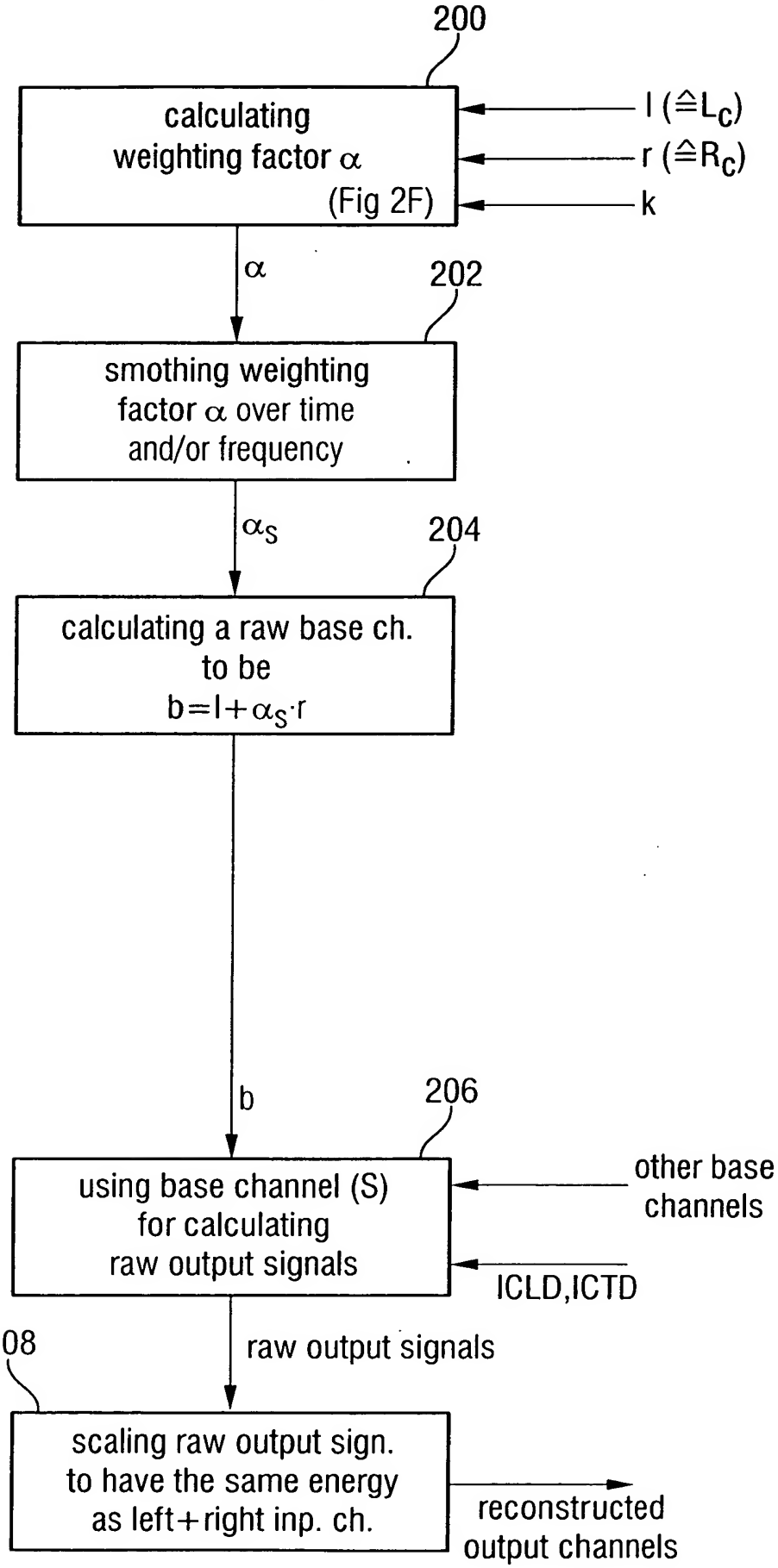

200
calculating weighting factor α (Fig 2F)
l (≙Lc)
r (≙Rc)
k
α
202
smothing weighting factor α over time and/or frequency
αs
204
calculating a raw base ch. to be b=l+αs·r
b
206
using base channel (S) for calculating raw output signals
other base channels
ICLD,ICTD
raw output signals
208
scaling raw output sign. to have the same energy as left+right inp. ch.
reconstructed output channels

FIG 3A

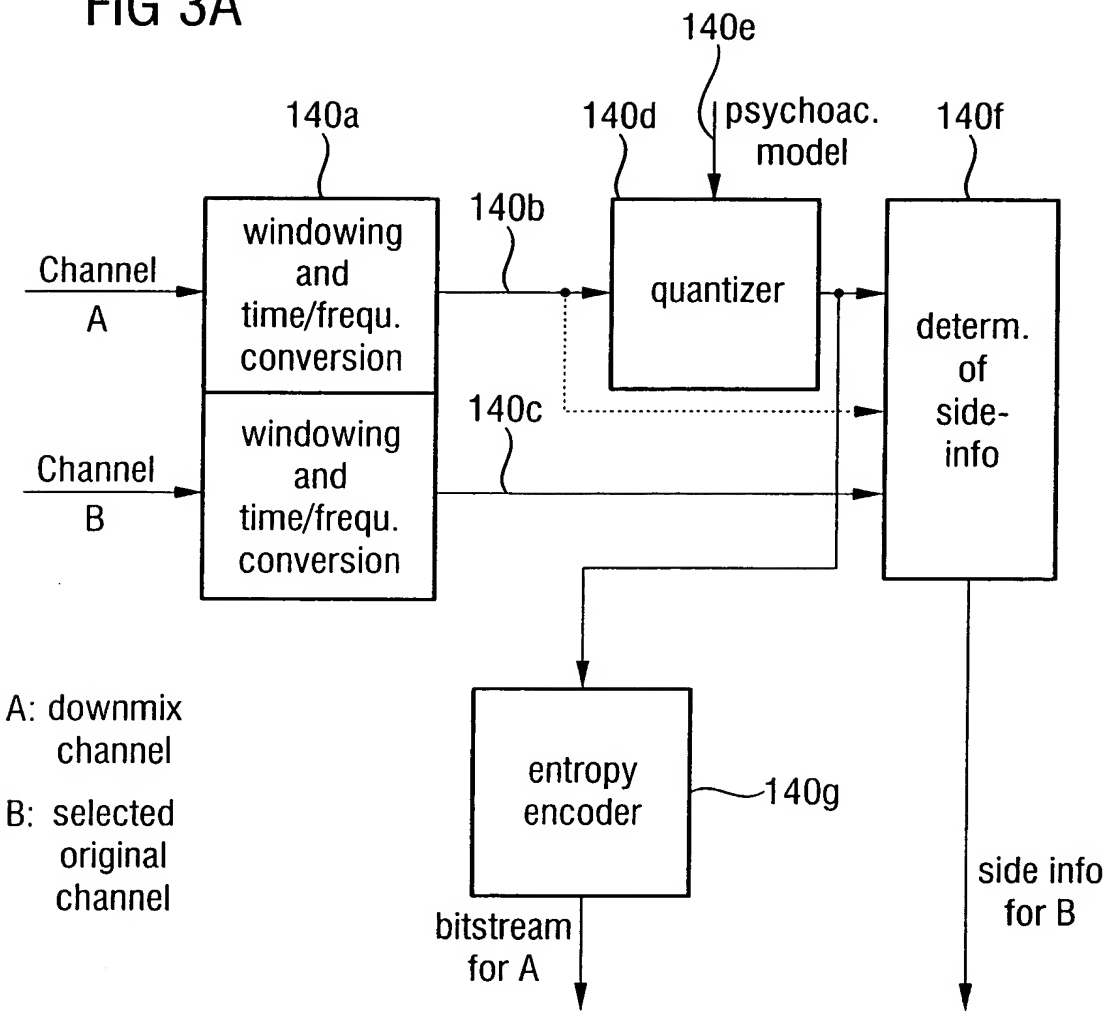

140e
140a
140d
psychoac. model
140f
140b
Channel A
windowing and time/frequ. conversion
quantizer
determ. of side-info
140c
Channel B
windowing and time/frequ. conversion
A: downmix channel
B: selected original channel
entropy encoder
140g
side info for B
bitstream for A

FIG 3B

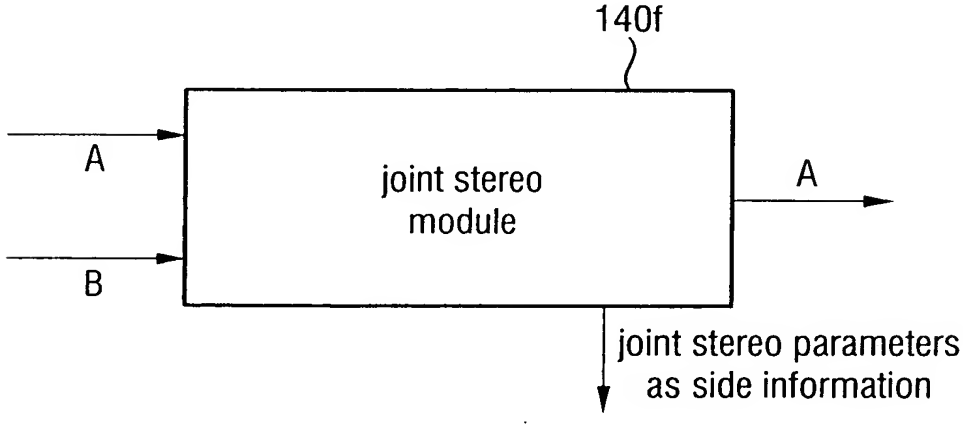

140f
A
joint stereo module
A
B
joint stereo parameters as side information

FIG 4 (encoder side)

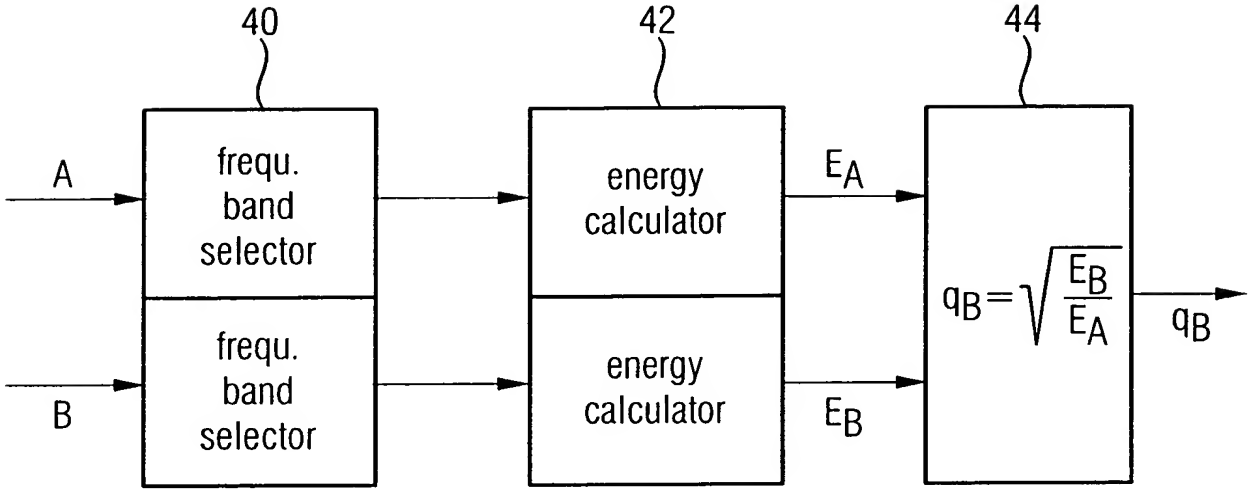


FIG 5 (decoder side)

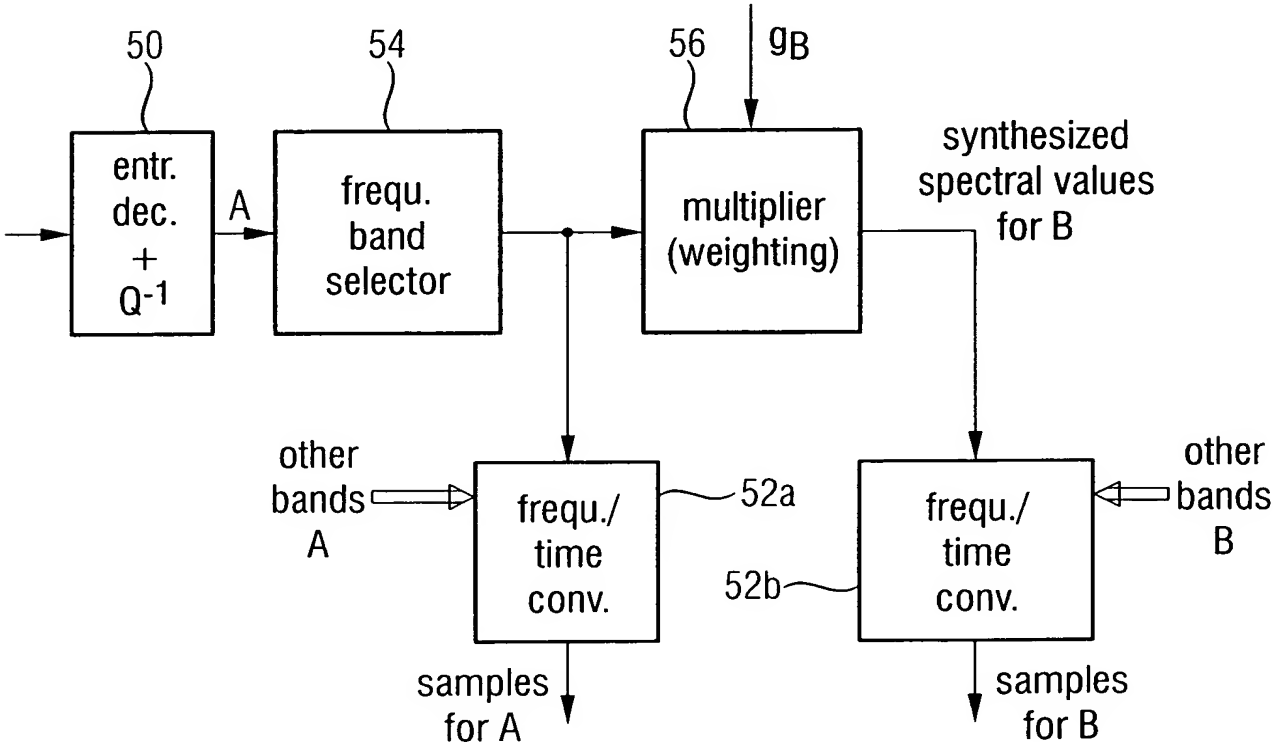


FIG 6

DOWNMIX

$L_C = t \cdot [L + a \cdot L_S + b \cdot C]$
$R_C = t \cdot [R + a \cdot R_S + b \cdot C]$

all signals are
time domain signals

$a,b,t \leq 1$
preferred: $a=b=0,7$
or: $a=0,5$; $b=0,7$

FIG 7

ch. side info	CHANNEL B	CHANNEL A
	side infos/parameters for:	are determined using:
l_i	L	L_C
l_{si}	L_S	L_C
r_i	R	R_C
r_{si}	R_S	R_C
c_i	C	L_C+R_C

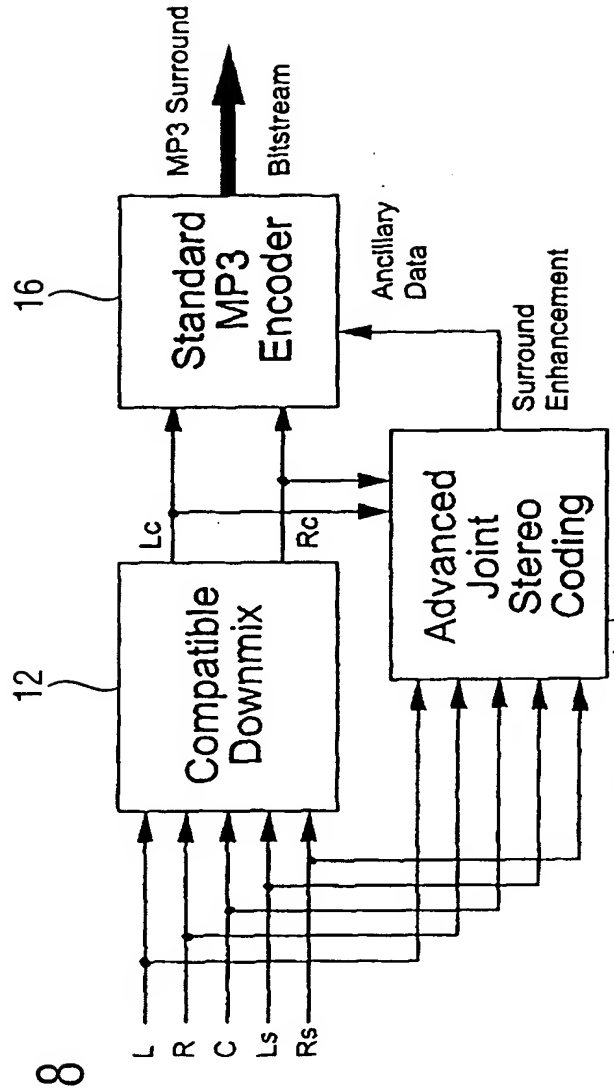

L
R
C
Ls
Rs
12
Compatible Downmix
Lc
Rc
Advanced Joint Stereo Coding
14, 14a, 14b
Surround Enhancement
16
Standard MP3 Encoder
Ancillary Data
MP3 Surround
Bitstream

FIG 8

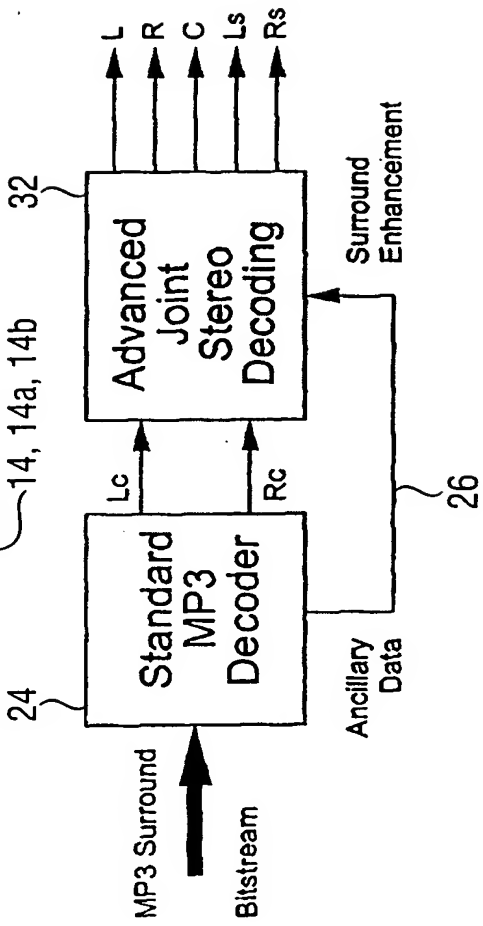

MP3 Surround
Bitstream
24
Standard MP3 Decoder
Lc
Rc
32
Advanced Joint Stereo Decoding
Surround Enhancement
26
Ancillary Data
L
R
C
Ls
Rs

FIG 9

FIG 10 (Prior Art)

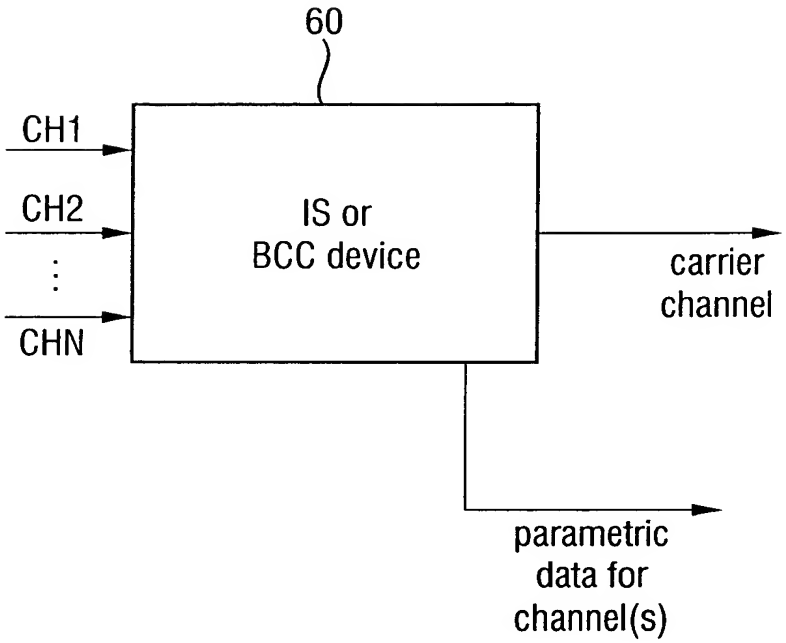


FIG 11 (Prior Art)

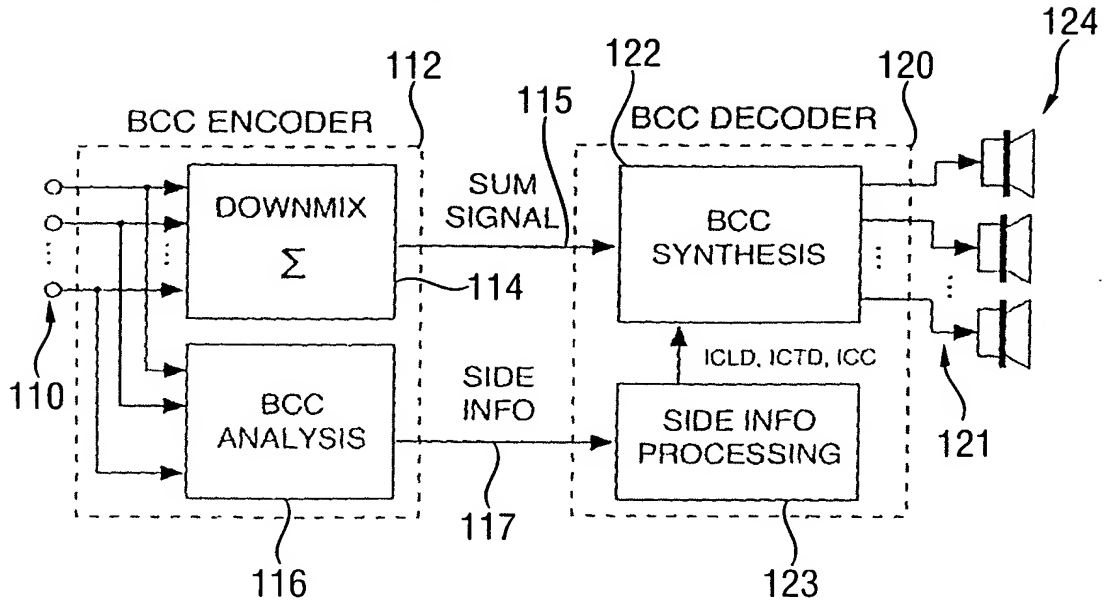


FIG 12 (Prior Art)

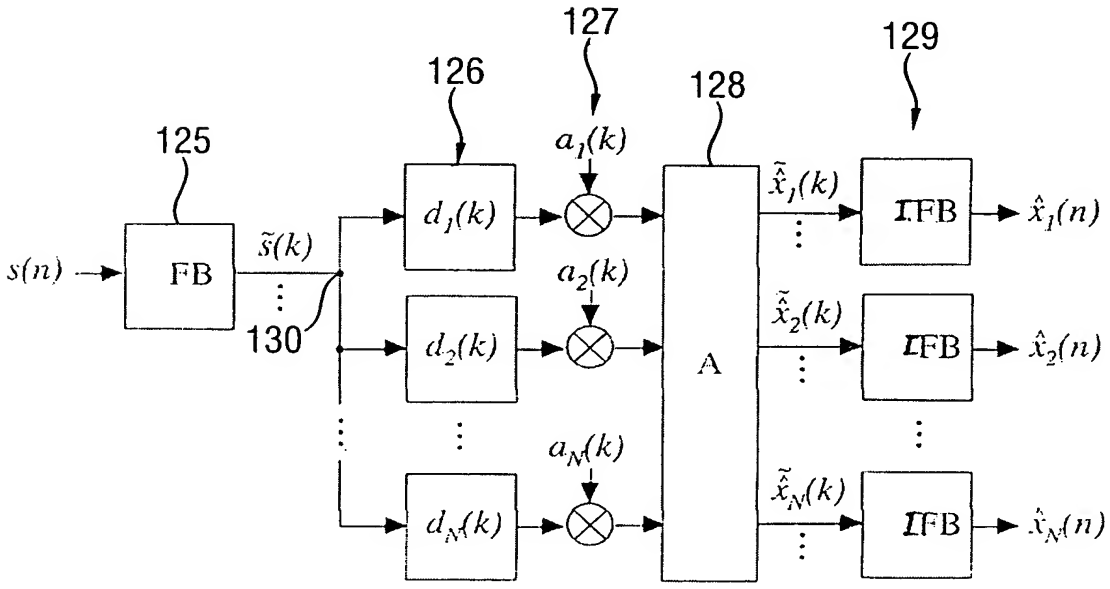


FIG 13 (Prior Art)

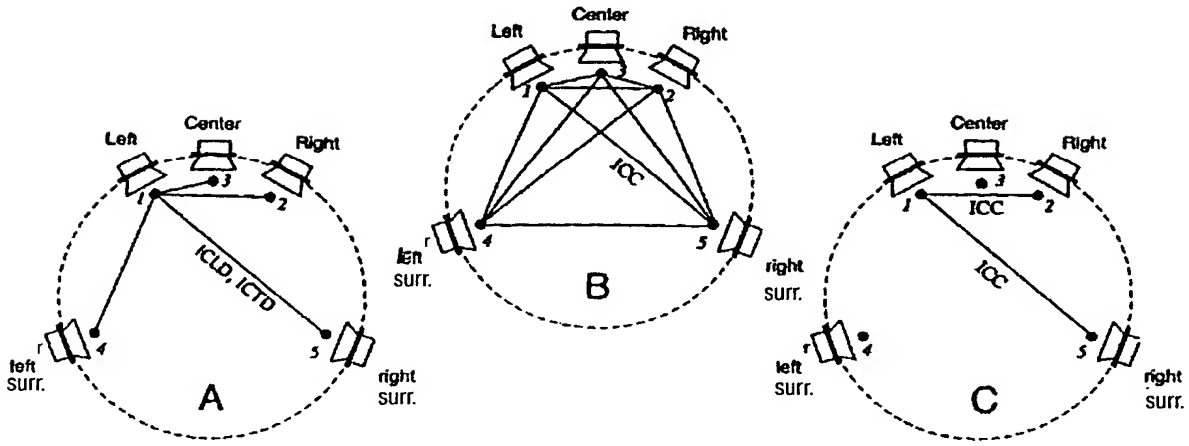


FIG 14A

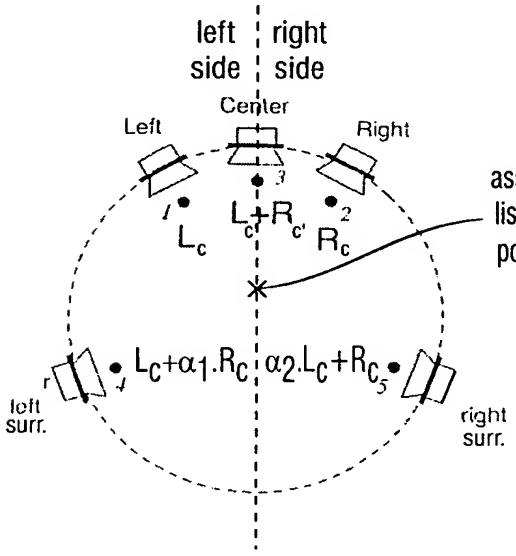


FIG 14B

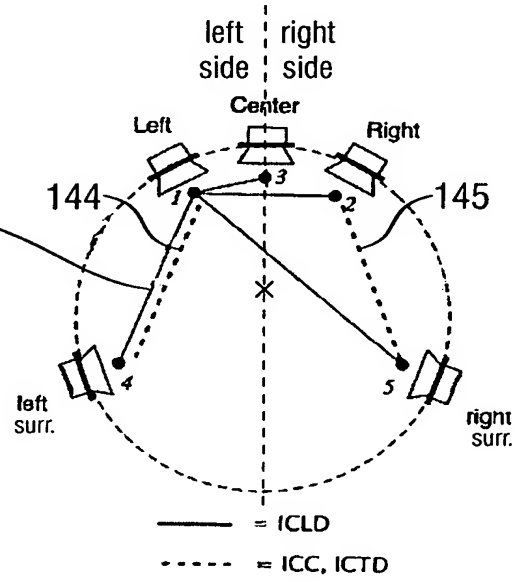
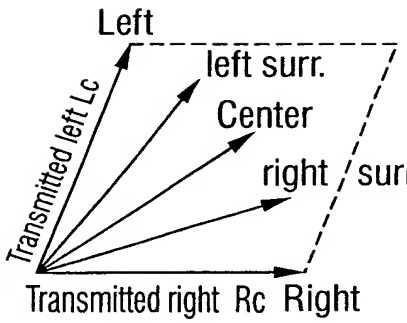


FIG 15A

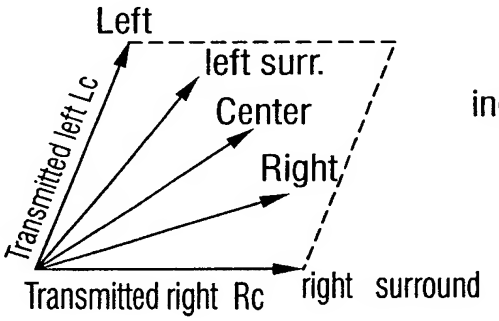
Base channels:
left=L
right=R
center=L+R
rear left=L+0.7R
rear right=R+0.7L



most independence between front left and front right

FIG 15B

Base channels:
left=L
right=R+0.7L
center=L+R
rear left=L+0.7R
rear right=R



most independence between left and rear right